

# **DIVISION 21 – FIRE SUPPRESSION**

## **21 10 00 WATER-BASED FIRE SUPPRESSION SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. The following standards and procedures apply to the design and installation of all wet pipe and dry pipe sprinkler systems. The design of fire suppression systems shall follow these guidelines, but the designer shall consult with WSU Engineering Services prior to beginning design work. The design of the Fire Sprinkler System shall be performed by a Fire Protection Engineer licensed in the State of Washington.

#### **1.02 DESIGN ASPECTS FOR ALL BUILDINGS**

- A. All Fire Suppression System design and installation shall comply with the most current and adopted version of NFPA 13.
- B. Contract Drawings for every new project and renovation shall include a complete riser diagram and shall show riser locations, main header location with details, and Fire Department Connection (FDC) location. Each floor of a multi-story building shall be shown on the riser diagram.
- C. In multi-level buildings, floor control valve and drain shall be accessible from the floor level. A drain assembly shall be provided for every floor except penthouses less than 1000 square feet.
- D. A Post Indicator Valve (PIV) shall be included in every new sprinklered building. The PIV should be located at least 20 feet from the building and shall be shown on the Contract Drawings and shall be at a minimum a 6 inch valve. All PIV locations must be reviewed and approved by the WSU Fire Marshall. All piping between the PIV and the building, including an approved back flow prevention assembly, shall be shown on the Contract Drawings.
  - 1. Every new sprinkler system is to have a back flow prevention assembly.
  - 2. Existing buildings which are being remodeled or renovated, with existing sprinkler systems not already having a PIV or back flow prevention assembly, shall have these items added to the system.

#### **1.03 DESIGN FOR NEW BUILDINGS**

- A. The Consultant shall recommend a list of hazard classifications for the proposed facility, to be reviewed and approved by the Authority Having Jurisdiction (AHJ).
- B. Designs shall be based primarily on Standard Response sprinklers. Specify Quick Response sprinklers only where required by code or where clearly advantageous based on the program.

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### **PART 2 - PRODUCTS AND MATERIALS**

#### 2.01 GENERAL

- A. Materials and Equipment: Where two or more pieces of equipment are required to perform interrelated functions, they shall be products of one manufacturer.
- B. Approval Guides: Unless otherwise indicated, all products shall be listed in the latest publication of Approval Guides for Underwriters Laboratory for the service intended.
- C. Acceptable Manufacturers of sprinkler specialties shall be one of the following (or equivalent):
  - 1. Central
  - 2. Grinnell
  - 3. Reliable
  - 4. Viking

#### 2.02 PIPE

- A. Schedule of Pipe: All pipe shall be ferrous, meet the requirements of the most current and adopted version of NFPA 13, Table 3-1.1.1 and be schedule 40 for pipe up to 2 inches. Schedule 10 may be used for pipe 2 1/2 inches and larger.
- B. Piping, Buried: C900 PVC "Blue Brute" or ductile iron. See specific requirements in section 22 11 00 "Facility Water Distribution."
- C. Piping, Building Interior: Galvanized pipe and fittings shall be used between the building entrance and the fire sprinkler back flow prevention assembly.
- D. Dry pipe systems, non-pressurized fire department pumper connection piping, and pipe located in corrosive environments shall meet the requirements of the most current and adopted version of NFPA 13, Table 3-1.1.1, be schedule 40 pipe, ferrous, and galvanized. No exceptions.
- E. Rust Inhibitive Paint: All exposed threads on galvanized pipe are to be coated with rust inhibitive paint.

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- F. Pipe Identification and Labeling: Designer shall specify: “Pipe identification shall be in accordance with the most current standards of the National Fire Protection Agency (NFPA).”

#### **2.03 FITTINGS AND COUPLINGS**

- A. Rust Inhibitive Paint: Grooved Fittings and couplings shall be coated with a rust inhibiting paint.
- B. Threaded Fittings: Threaded fittings shall be cast iron or malleable, class 125 NPT, rated for 175 psi cold water working pressure, and shall conform to the most current and adopted versions of ANSI B16.4, ASTM 126 and ANSI B2.1.
- C. Nipples: No close nipples will be permitted. For short pipe connections use standard short nipples.
- D. Adjustable Nipples: Adjustable drop nipples may be used on flush or concealed type sprinklers only and must be of double o-ring seal design.
- E. Thread-O-Lets: Shop welded Thread-O-Lets may be used where a certified welder is used, meeting the requirements of NFPA 13. Field-welded Thread-O-Lets shall not be accepted.
- F. Grooved Fittings: 90 degree bends, 45 degree bends, tees, and reducers shall be malleable iron or ductile. The fittings shall be:
  - 1. Gustin-Bacon
  - 2. Gruvlok
  - 3. Victaulic
  - 4. Viega
- G. Adapter Flanges: Adapter flanges (fittings) shall be cast iron/class 125 conforming to the most current and adopted version of ANSI B-16.1, with a rust inhibiting coating. The adapter flanges shall be:
  - 1. Gustin-Bacon
  - 2. Gruvlok
  - 3. Victaulic
  - 4. Viega
- H. Grooved Couplings:

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1. Grooved couplings and reducers shall be malleable or ductile iron conforming to the most current and adopted versions of ASTM A-47.
  2. Coupling gasket shall be molded Elastomer (EPDM) per the most current and adopted version of ASTM D2000, Victaulic grade "E" (type A).
  3. On dry pipe systems a "FlushSeal" or "Flush Gap" gasket shall be used.
  4. Grooved couplings and reducers shall be of the same manufacturer as used for the grooved fittings.
- I. Plain End Couplings: Plain end couplings (Roust-A-Bouts, Plainloks or similar couplings) may be used for modification of existing sprinkler systems, pending review by the WSU Fire Marshall. Plain end couplings shall not be acceptable for new sprinkler systems.
- J. Hole Cut Outlets, New Systems: No hole cut outlets may be used on new sprinkler systems.
- K. Hole Cut Outlets, Existing Systems: Hole cut bolted branch outlets couplings shall be used on existing sprinkler systems only in isolated locations as approved by the Owner. Hole cut outlets shall be a full bodied outlet.
1. Style 920 by Victaulic by Gruvlok
  2. Gustin-Bacon

#### **2.04 HANGERS AND SUPPORTS**

- A. Hangers: Provide hangers to support all piping in perfect alignment without sagging or interference, and permit free expansion and contraction.
- B. Pipe Rings: Pipe rings to be zinc coated Grinnell figure 69 or approved equal.
- C. Hanger Rods: Hanger rods to be electro-galvanized.
- D. C-Clamps: All c-clamps (beam clamps) shall be equipped with earthquake retaining straps.
- E. Riser Clamps: Riser clamps shall not protrude more than 2 inches beyond the edge of the hole. The riser clamps shall be UL listed, Grinnell Figure 261 or approved equal.
- F. Concrete Anchors: Concrete expansion anchors shall be:
1. Hilti
  2. Phillips

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3. Rawl

4. ITW

G. Explosive Anchors: Explosive driven type fasteners are not permitted.

#### **2.05 EARTHQUAKE BRACING**

A. Earthquake bracing shall be with a pipe clamp and pipe with a swivel type anchor or similar to those illustrated in the most current and adopted version of NFPA 13.

#### **2.06 VALVES**

A. Outside Screw and Yoke (OSY) Valves: OSY valves shall be cast iron, flanged and rated for 175 psi, non-shock cold water working pressure.

B. Isolation/Control Valves: Sprinkler system, standpipe, and other above ground controlling valves shall be gear-operated slow-close butterfly valves with flag type indicator, cast iron lug body, bronze disc, EPDM crowned seat, stainless steel stem with bronze bushings, two internal single-pole, double-throw monitor switches, and locking chain supplied by the valve company.

1. Grinnell Series 8000FP or approved equal.

C. Supervised Valves 1 1/2 Inches and Smaller: Sprinkler controlling valves 1 1/2 inches and smaller shall be slow-close supervised butterfly valve:

1. Milwaukee Valve Company, model BB-SC.

D. Valves Controlling Sprinklers in Elevator Machine Room and Top of Elevator Shaft:

1. Sprinklers located in elevator machine rooms and at the top of the elevator shaft shall be controlled by a supervised butterfly control valve with normally closed contacts:

i. Milwaukee Valve Co., model BB-S02-R.

ii. Designer shall consult with WSU Environmental Health and Safety (EHS) if it is a high-rise building or high-rise building requirements are being applied to this project.

E. Drain Valves: Drain valves shall be UL Listed, screw-in bonnet bronze globe valves, rated to 175 psi non-shock cold water working pressure. Low point drain valves shall have a 3/4 inch brass nipple with 3/4 inch male hose threads and cap.

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1. Nibco
2. United

#### **F. Check Valves:**

1. Grooved, iron body, bronze seat, stainless steel clapper with a replaceable rubber seal (a rubber seal integral with the seat is not acceptable), and 175 psi non-shock cold water working pressure.
  2. Viking model D, Central model 90 or approved equal.
- G. Provide a double check valve assembly including the two OSY gate valves. The assembly shall be an approved double check valve assembly conforming to the standards of the most current Washington State Department of Health Cross-Connection Control Program.
1. Febco
  2. Watts

#### **2.07 SPRINKLERS**

- A. Sprinklers: Provide ordinary temperature rated sprinklers with a ½ orifice. Areas subject to high temperatures exceeding 110 degrees Fahrenheit or as noted in the most current and adopted version of NFPA 13 shall have sprinklers rated for 212 degrees Fahrenheit or as required.
1. "I" occupancy in the required Quick Response sprinklers:
    - i. Reliable Model F1-FR
    - ii. Viking Model M.
    - iii. Flow control and extended coverage sprinklers shall only be specified after consultation and approval of the WSU Life Safety Department and EH&S.
  2. Designer shall describe each sprinkler to be used for all areas of the project, including style (upright, pendent, sidewall, semi-recessed etc.); type (fusible link, solder, or frangible bulb); finish (white, brass, chrome, decorator color, etc.); and type and finish of any canopies or escutcheons when applicable. List at least three different manufacturers and model numbers for each type of sprinkler.
  3. Recessed Sprinklers: Provide recessed sprinklers in all finished lay-in or plaster ceilings. Provide chrome sprinklers with a white escutcheon.

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- i. Reliable model F1 Recessed
  - ii. Viking Micromatic Model M with escutcheon model E-1
  - iii. Gem model F985
  - iv. Omega Sprinkler heads shall not be acceptable.
4. Recessed sprinklers may only be used in accordance with their listing or approval. They cannot be used in storage occupancies or occupancies involving special hazards such as flammable liquids.
- B. Spare Sprinklers: Provide spare sprinklers and escutcheons for each type and style of sprinkler used in accordance with the most current and adopted version of NFPA 13 and proportioned based upon the number of each type and style of sprinkler used on the job. In no case should fewer than six of each type of sprinkler heads be provided. Spares of dry-pendent sprinklers are not required.

#### **2.08 SPARE SPRINKLER CABINETS**

- A. Provide a spare sprinkler cabinet (or cabinets) to accommodate the required number of spare sprinklers and escutcheons. Include a wrench for each type of sprinkler in the cabinet.

#### **2.09 SPRINKLER HEADGUARD**

- A. Provide UL Listed sprinkler headguards for sprinkler heads subject to mechanical damage or for any sprinkler of which any portion is at, or lower than, 7 feet above the floor.

#### **2.10 FIRE DEPARTMENT CONNECTION**

- A. A properly labeled sign indicating "Auto Sprinkler" or "Auto Sprinkler / Standpipe" shall be provided as a part of the escutcheon or as a separate sign permanently affixed to the building, in accordance with NFPA 13. Lettering for the sign shall be a minimum one inch high. Choose either chrome or polished brass for the FDC and escutcheon.
- B. Provide a fire department connection (FDC) with horizontal type connections, dual clapper, 2-1/2 inch inlets, with rocker lug caps, and chains.

#### **2.11 BALL DRIP**

- A. Where feasible, provide a bronze ball drip for the fire department connection inside of the building and pipe to the nearest floor drain.

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- B. At locations where an interior ball drip is not feasible, provide an accessible manhole for servicing and maintaining the ball drip.
- C. Ball drip location and details shall be reviewed and approved by WSU Engineering Services.

#### **2.12 ROOF FIRE DEPARTMENT CONNECTION**

- A. Designer shall consult with WSU Engineering Services and EH&S on the requirements for a roof FDC.
- B. Provide a wall-type indicator post and butterfly valve for the roof indicator post, with a two-way roof fire department connection with rocker lug caps and chains:
  - 1. Potter-Roemer 5870 series

#### **2.13 POST INDICATOR VALVE**

- A. Provide a post indicator valve (PIV) on the fire service water main into the building.
- B. Post Indicator valves shall be Kennedy #641 or equal.

#### **2.14 HOSE VALVE**

- A. Provide 2-1/2 inch polished brass hose valves with a cap and chain. Potter-Roemer model 4065 with model 4626 (cap and chain) or approved equal.

#### **2.15 SIGHT DRAIN**

- A. Provide a single piece sight drain that conforms with the standards of NFPA 13.

#### **2.16 PRESSURE GAUGE**

- A. Provide a 3-1/2 inch diameter, bourdon type pressure gauge, 0-300 pounds, 1/4 inch soft metal seat globe valve with arrangements for draining pipe between gage and valve, located near each main or floor control valve assembly on the main line or near each test location.

#### **2.17 DRUM DRIP**

- A. Provide a cast iron drum drip at the low drain points on a dry system.

#### **2.18 LINK SEALS**



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- A. Provide link seals when underground pipe passes through an exterior wall or slab on grade. Flexible couplings or push-on joints located within 1 foot of each side of the wall must be included in the link seal installation (most current and adopted version of NFPA 13 4-5.4.3.4 exception No. 3).

#### **2.19 WALL ESCUTCHEON**

- A. Provide plastic split ring type escutcheons and paint to match the wall. Escutcheons are only required with exposed pipe installations.

#### **2.20 DRY PIPE ALARM VALVE**

- A. For dry systems only, provide a dry pipe alarm valve, trim package, accelerator and air maintenance device. All components shall be products of the same manufacturer. Preferred manufacturer: Viking model F-1.

#### **2.21 AIR COMPRESSOR:**

- A. For dry systems, provide a tank-mounted air compressor sized to completely refill the system within 30 minutes. Minimum tank pressure shall be 60 psi.
  - 1. Preferred manufacturer: Quincy. Alternatives require approval from WSU Engineering Services.

#### **2.22 FIRE ALARM RELATED EQUIPMENT**

- A. Equipment in this section shall be provided, installed, and adjusted by the Sprinkler Contractor. Coordinate installation of fire sprinkler system with all other trades. Conduit, wiring, and terminations shall be by others.
- B. Waterflow Switch: Potter VSR-F. No exceptions.
- C. Valve Supervisor Switch: Potter OSYSU-A2 for OSY valves and Potter PIVSU-A for PIV valves. No exceptions. Butterfly isolation valves shall be equipped with two internal single-pole, double-throw monitoring switches.
- D. Pressure Type Waterflow Switch, for dry systems only:
  - 1. Potter PS10-2. No exceptions.
- E. High-Low Air Pressure Monitoring Switch, for dry systems only:
  - 1. Potter PS40-2. No exceptions.

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- F. Supervised Valves 1-1/2 Inches and Smaller: Slow-Close Supervised Butterfly valve from Milwaukee Valve Company, Model BB-SC. No exceptions.

#### **2.23 SIGNS AND PLACARDS**

- A. Provide stamped metal hydraulic placards, labeled in accordance with the requirements of NFPA 13.
- B. At the conclusion of the project, provide blank metal signs for all control, drain and test valves to the WSU Construction Manager. WSU Life Safety shall fill out these signs in accordance with the Fire Alarm Control Panel schedule.

#### **2.24 PIPE THREAD SEALANT**

- A. Provide a brush-on pipe thread sealant with Teflon, Grinnell Tuff-Loc or approved equal.

### **PART 3 - EXECUTION**

#### **3.01 SHUTDOWN OF EXISTING SYSTEMS**

- A. Any shutdowns of existing water distribution systems, fire sprinkler systems, domestic water systems or fire alarm systems shall be approved by the WSU Construction Manager. Provide advance written notice at least 7 days prior to the shutdown.

#### **3.02 CONNECTIONS**

- A. Fire mains and lead-ins shall be flushed thoroughly before connection is made to system piping, in accordance with NFPA 13.

#### **3.03 PENETRATIONS**

- A. Required Clearance around Pipe:
  - 1. Piping passing through fire rated assemblies, including fire rated gypsum wall board (GWB) assemblies shall be provided with clearance around the entire circumference of the pipe, as required by the most current and adopted version of NFPA 13.
  - 2. Penetrations of walls, floors, or ceilings shall be made in a neat manner using properly sized hole saw or masonry/concrete coring as necessary.
- B. Fire Rated Assemblies:
  - 1. The annular space between the wall or pipe sleeve and the sprinkler pipe in fire rated assemblies shall be filled with UL classified firestopping

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material in accordance with the manufacturer's recommendation and section 07 84 00.

- C. Escutcheons: Split wall plates or escutcheons shall be installed where exposed piping or hangers pass through a finished floor, wall or ceiling and shall fit snugly, securely and cover the opening.

#### **3.04 CONTROL VALVES**

- A. Install all control valves, supply valves and test valves in readily accessible locations, with the valve handle or wheel no higher than seven feet above the finished floor.
- B. Design Consultant shall submit Floor Control Valve Assembly standard details no later than 50% Construction Drawings.

#### **3.05 INSPECTOR'S TEST AND DRAINS**

- A. Provide inspector's test valves for each floor of each system. The inspector's test assembly shall be piped to discharge to the WSU Sanitary Sewer system. Discharge shall be into a drain riser located adjacent to the system riser or to a drain for a remote inspectors test valve when provided (i.e., dry systems). The valve shall be readily accessible, at a location no higher than seven feet above finished floor.
- B. Main Drains:
  - 1. Designer shall coordinate with the plumbing drawings to indicate the appropriately sized floor drain where required.
  - 2. Provide main drains at all system and floor control valves. Discharge into the WSU sanitary sewer system via floor drain with funnel. No sprinkler system drain line shall be piped directly into a drain; there shall be at least a ½ inch air gap between the pipe and the funnel/drain.
- C. Auxiliary Drains: Provide auxiliary drains at all low points of the system, where the trapped section of pipe exceeds five gallons. As a minimum, the drain shall consist of a valve, a ¾ inch brass nipple with ¾ inch male hose threads, and cap. Locate auxiliary drains in unfinished areas without suspended ceiling wherever possible. In finished areas, with lathe and plaster or GWB locate the hose bib within six inches of an access panel, minimum 12" x 12". If located in bathrooms the panel is to be stainless steel.

#### **3.06 GAUGES**

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- A. Provide gauges at the main system riser and each floor control valve. Tap gauges from the main piping, not from the drain piping.

#### **3.07 LAY-IN CEILINGS**

- A. Designer shall modify as required. For lay-in suspended acoustic ceilings, sprinklers shall be centered on the tiles (in both directions) and carefully aligned.

#### **3.08 EARTHQUAKE BRACING**

- A. Install earthquake bracing in accordance with the most current and adopted version of NFPA 13.

#### **3.09 INSPECTION, PUNCH LIST AND HYDROSTATIC TESTS**

- A. Partial System Test or Inspection:

1. Perform tests with the sprinklers installed in their final positions.
2. Where it is critical to the continuance of the project as a whole to cover portions of the piping with ceilings or walls prior to the completion of the entire system, partial testing of the system may be performed after receiving written approval from the WSU Project Manager. In this case, "partial" indicates an entire zone or floor of one system. A satisfactory partial test does not relieve the Contractor from performing all final testing procedures.

- B. Preliminary Hydrostatic Test:

1. Perform a hydrostatic test, conforming to the requirements of the current and adopted version of NFPA 13, after the system has been fully installed and is ready for service, and prior to installation of suspended ceilings.
2. Take special precautions to detect and stop water leakage so that any water damage will be minimal.

- C. Test of Fire Alarm Equipment:

1. Test the operation of the water flow, pressure, and supervisory switches.
2. When the Contractor has confirmed that the system is in complete operating condition in every respect, notify the Construction Coordinator in writing that the system has been inspected and tested the system and that it is ready for final inspection.

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D. Final Hydrostatic Test and Inspection:

1. Final inspection of all phases of the Work shall be made by the Architect and Engineer, Fire Marshal, WSU Life Safety Department and the WSU Construction Manager.
2. Notify the WSU Construction Manager at least 14 days in advance of making the required tests, so that arrangements may be made for the presence of the Architect and Engineer, Fire Marshal, and WSU Life Safety representative to witness the tests.
3. The installing foreman or other representative of Contractor shall be present at this time to conduct any operating tests of alarm, drains or other system functions requested by the Architect and Engineer, Fire Marshall, or WSU Construction Manager.
4. Test the complete system for not less than 2 hours at a pressure of 200 psi (or 50 psi above static pressure, whichever is greater) without the addition of any water. Any leaks or drips shall be repaired immediately by the Contractor.

**END OF SECTION**